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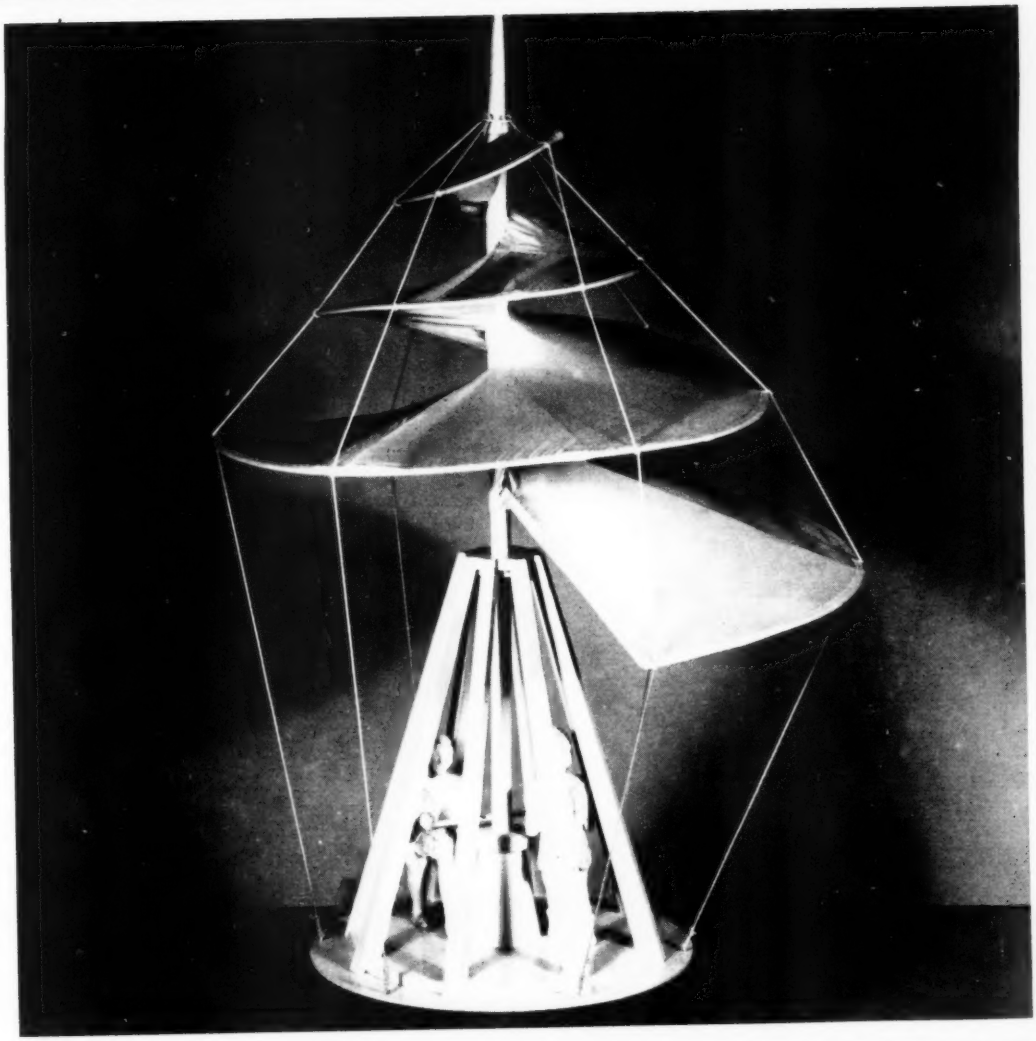

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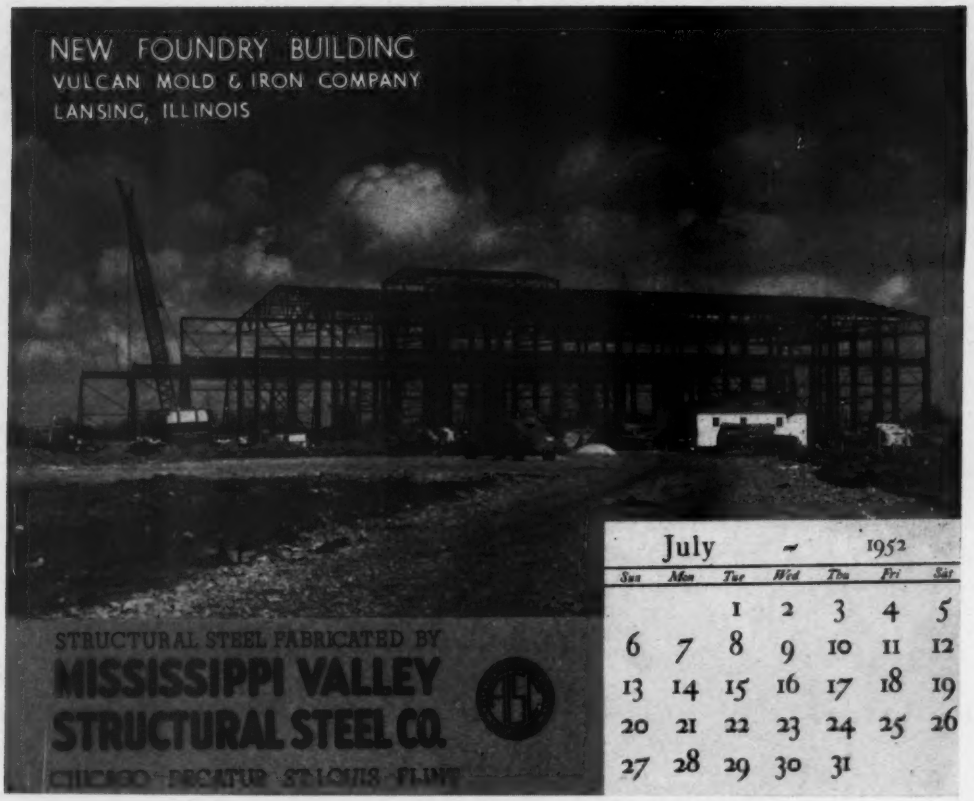
INDUSTRIAL WASTE CONTROL
IN A CORN MILLING INDUSTRY—PAGE THREE

Vol. 4 APRIL, 1952 No. 8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COVER STORY

Leonardo da Vinci's design for an aerial screw heralded the helicopter of the present day and also is credited by many authorities as being the forerunner of the modern propeller. Motive power was to be supplied by a spring-driven mechanism to operate in the manner of modern clockwork.

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TEAR OFF — MAKE YOUR RESERVATION NOW

Industrial Waste Control

in a

Corn Milling Industry

By George H. McIntosh
and Eric M. Van Patten
American Maize Products Co.

American Maize Products Company is a producer of corn products by the wet milling process. The plant of the company was built in its present location in the north part of Hammond, Ind. in 1907 largely because of the availability of an unlimited supply of water from Lake Michigan for cooling and process purposes, and the availability of the lake for the discharge of such water. During the past several years, the company has utilized as much as 15 million gallons of water a day.

Prior to 1940 there were no sewage facilities of any nature in the plant area. Consequently the entire plant effluent was discharged into Lake Michigan and equaled at times as much as 350,000 persons or 10 population equivalents per bushel of corn processed. In 1940 the Hammond Sanitary Board constructed an intercepting sewer into the plant area for the purpose of diverting sanitary sewage and trade waste to the modern treatment plant of the district. The company then constructed sewage facilities on its property and connected the same with the intercepting sewer. Since then the company has diverted all of its sanitary sewage and a portion of its trade waste to the treatment plant of the district. This relieved the situation to Lake Michigan considerably, but the company continued its program of waste abatement with purpose. In September 1944, the company agreed to make further improvements which were incorporated in a stipulation filed in the case of the State of Illinois vs State of Indiana et al, in the Supreme Court of the United States.

A definite program of procedure was outlined in 1944, completed in 1950 and subsequently resulted in the company's dismissal from the case on November 6, 1950. For the past year the total trade waste discharged by the company averaged 0.7 of a population equivalent per bushel of corn ground. Of this volume, waste essentially very dilute entrained sugar solids were discharged in cooling water to Lake Michigan at the rate of approximately 300 pounds a day. The balance was sewered to the Hammond sanitary system.

Generally speaking, the program was accomplished by isolating all waste bearing water, the reuse or bottling up of all process water, the recovery of all solids possible and the reduction of considerably volatile organic matter. The company realized that they were not in a position to attack the problem as sanitary engineers specializing in waste disposal and therefore felt that this method of approach was the most feasible. They hoped that improved process operations and some increased solids yield resulting from such a program would defray a part of the heavy capital expenditures attendant with waste abatement. It is believed at present that plant effluents are as good as can be obtained under present conditions of development in the industry. Improvements underway at the plant, however, should help in further reduction of our bio-loading.

Manufacturing Process

Before reviewing in some detail the method and results of our abatement program, a brief description of the 24-hour continuous wet milling process is helpful.

The cleaned shelled corn is steeped in a weak solution of sulphurous acid. The corn (45,000 bushel daily grind) is then doubly milled by attrition and Buhr mills. This milled material is separated into the following fractions: starch, germ, proteinaceous solids, fibrous material and soluble solids. Dextrines, gum, and food starches are manufactured from the basic starch carried in water suspension and in many instances chemically treated. (The filtrates from these slurries are mostly very dilute waters, the solids from which have very little commercial value yet represent a source of trade waste.) Corn Syrup, sugar dextrose, lactic acid and many other products are manufactured from dilute water-starch suspension by acid hydrolysis or microbiological conversions. These dilute products must be concentrated before they are in a marketable form and this concentration involves the use of elaborate vacuum evaporation equipment, the condensate from which are all subject to dilute solids entrainment. The proteinaceous material is either combined with the soluble solids and fibrous material or prepared directly as animal feed. The entire process is a wet milling process and all materials are handled as

---

This paper, prepared by the two authors, was given before the Western Society on May 5, 1952, by Dr. McIntosh. Dr. McIntosh is chemist in charge of the company's control laboratory.

slurries to the last manufacturing steps.

Figure 1 shows a simplified flow sheet of our wet milling process.

The Problem Outlined

In January 1944, an extensive six-month survey and study of all Amaizo industrial waste was initiated with the following purposes in mind:

1. To classify the pollution load of the total industrial waste to all of its individual sources.
2. To isolate and determine the source, basic characteristics and magnitude of each source of waste.
3. To determine the seasonal fluctuations, if any, of the strength of the trade waste.
4. To determine and develop methods to reduce and control the strength of these wastes.

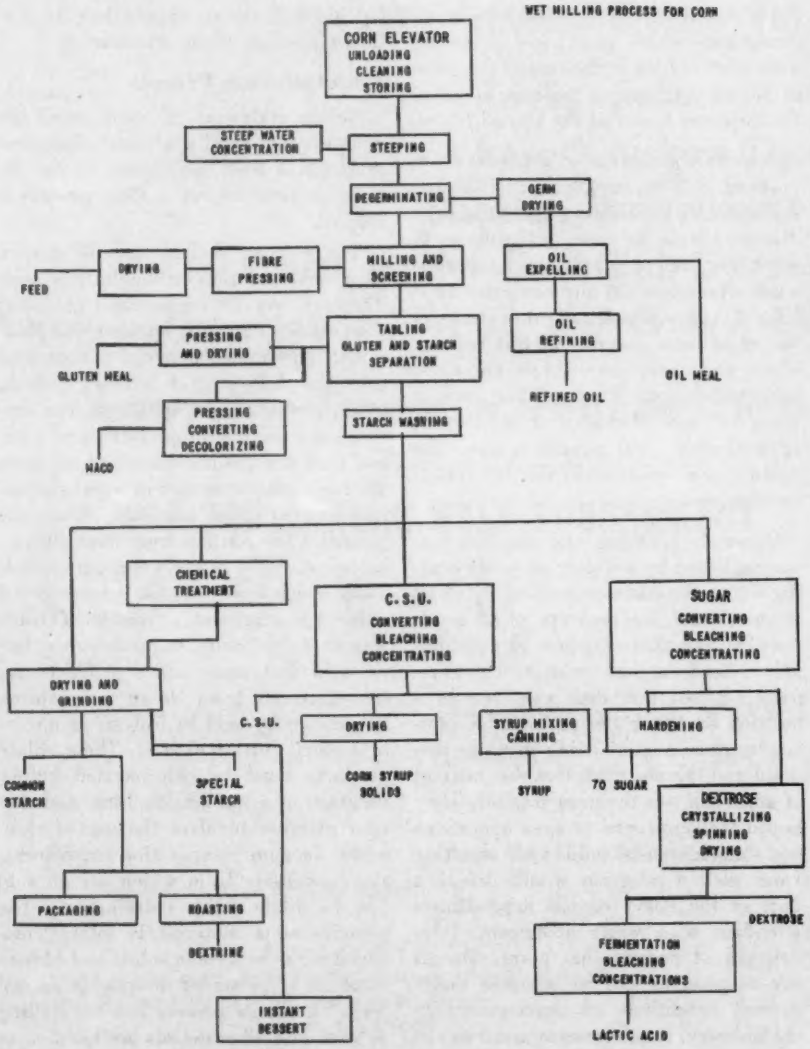
The problem was approached by setting up a unit of trained personnel within the research department equipped and trained to gather analytical data on volumes, B.O.D. loadings, gravimetric solid loadings and bacterial contamination as well as obtain basic information on the bio-loading potentials of various organic matters subject to inclusion in our trade waste. This unit also carried out fundamental work on possible pretreatment and process water reutilization practices applicable to the problem.

Essentially, the following sources of trade waste from the plant were recognized:

1. Refinery bone char wash water.
2. Entrained solids in the condensate from syrup and sugar evaporators in the refinery.
3. Entrained solids and volatiles in the Feed House evaporators used for concentrating the steep water, process and filtrate water.
4. Entrainment of lactic acid and calcium lactate in the Lactic Acid Department evaporators.
5. Starch filtrate water from the starch washing operations.
6. Excess plant process and manufacturing water which was not economical to concentrate because of the low solids content.
7. Surface sewer water and water from floor washing operations.
8. Inadequate equipment for handling spills and the occasional failure of process equipment.
9. Oil refinery operation (deodorizer and wash water).

FIGURE NO. 1

FLOW CHART OF WET MILLING PROCESS FOR CORN



Sewer System

Our plant is served internally by two discharge systems: (1) Hammond system for the sanitary sewage and some industrial water; (2) Lake Michigan system for the cooling water and water bearing negligible bio-loading.

In 1944 both systems were so laid out that trade waste loading could easily be diverted from one system to the other. This was done by means of diversion chambers. All sanitary wastes were isolated, however, so that there was no possible way for their disposal into the Lake Michigan system.

Two years ago a third system was added whereby a 10-acre lagoon could be used to protect the other two systems in cases of emergencies.

The Lake Michigan system, which handles the bulk of the water from the plant is comprised of three main arteries. These are:

I. Feed House Artery
   - A. Feed House evaporator cooling and condensate water.
   - B. Starch department filtrate and vacuum pump seal water.
   - C. Oil refinery deodorizer barometric downleg water and wash water.

II. Refinery Artery
   - A. Corn Syrup and sugar evaporator condensate and cooling water.
   - B. Bone char filters, wash and tempering water.

SOURCE	VOLUME	P.E.
I. FEED HOUSE ARTERY		
A. FEED HOUSE EVAPORATORS - CONDENSATE	200,000	90,000
1. Due to Entrained Solids - 50,000 P.E.		
2. Due to Volatiles - 40,000 P.E.		
B. STARCH DEPARTMENT-FILTER WATER	120,000	80,000
C. OIL REFINERY-DEODORIZER AND WASH WATER	1,200,000	10,000
D. COOLING WATER AND MISCELLANEOUS	5,480,000	10,000
TOTAL	7,000,000	190,000
II. REFINERY ARTERY		
A. SUGAR AND SYRUP EVAPORATORS-CONDENSATE	200,000	30,000
B. BONE CHAR-WASH WATER	180,000	30,000
C. MISCELLANEOUS PROCESS WATER	40,000	24,000
D. COOLING WATER AND MISCELLANEOUS	3,780,000	6,000
TOTAL	4,200,000	90,000
III. LACTIC ACID ARTERY		
A. EVAPORATOR-CONDENSATE	150,000	40,000
B. SPILLS AND WASH WATER	20,000	15,000
C. COOLING WATER AND MISCELLANEOUS	3,330,000	5,000
TOTAL	3,500,000	60,000
GRAND TOTAL	14,700,000	340,000

FIGURE NO. 3 - SUMMARY OF SURVEY-SIX MONTHS-1944

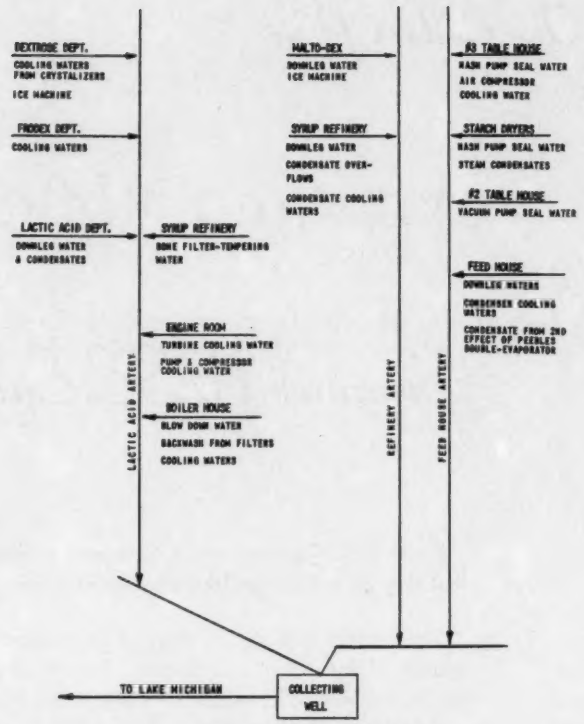


FIGURE NO. 5 - LAKE MICHIGAN OUTLET

C. Floor washings and waste water from process equipment.
D. Cooling water from refrigerating equipment.

III. Lactic Acid Artery

A. Lactic Acid Department.
1. Cooling and condensate water from evaporator.
2. Wash water and process water.

B. Dextrose Department cooling water.

C. Corn Syrup Solids Department cooling and wash water.

D. Boiler House.
1. Cooling water.
2. Blow down water.
3. Filter back wash water.

With the establishment of the above sewer system it was possible to start the study of the actual loading especially the Lake Michigan system. Sampling devices were installed at strategic points as well as metering devices.

The six-month study carried out in 1944 revealed the following loading to the Lake Michigan sewer. See Figure 3. (At this time the Hammond system was carrying only the domestic waste.)

As a result of this study it was decided that the following program would have to be pursued to meet our agreement.

1. Reduce the solids entrainment losses in the glucose refinery evaporating equipment by the installation of new concentrating equipment or rebuilding the existing equipment.

2. Completely discard the Feed House evaporators and install new equipment allowing for additional evaporating capacity to concentrate filtrate and wash water that normally would be sewered to our economic advantage. The new evaporators to have surface condensers so the condensate could be isolated from the cooling water.

3. Install new starch filters whereby less wash water would be required for washing the starch and still give a quality product.

4. Devise means for limiting the amount of bone char wash water.

5. Completely revamp the concentrating equipment in the Lactic Acid Department.

6. Isolate certain waste water such as the acid or alkali water from boiling out the evaporators when they are cleaned.

7. Eliminate the sewering of all excess process water by either reusing or evaporation.

8. Possible reduction of the volatile matter in the condensate from the steep water.

On the basis of this study the company proposed the following program for eliminating the trade waste:

1. Eliminate all water bearing organic and inorganic solids from the Lake Michigan system except such traces of sugar solids not possible to separate from the refinery water. Our studies had

(*Continued on Page* 17)

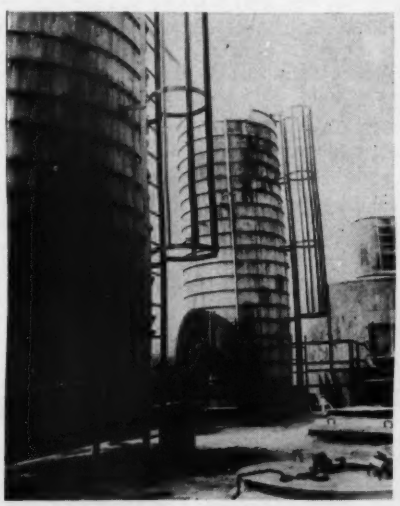


FIGURE 4—Condensate Aerators

The Editor's Page

Summer WSE Engineers—Some Are Not

Some WSE engineers are not summer engineers, they just fade away, but come autumn we know that they do not die and there is further evidence that they are not all "old soldiers."

The Society itself for 81 years of its existence went into a state of suspended animation during the months of June, July and August. Two years ago, however, the necessity of providing year-round activities and service for our membership became apparent.

In view of this a golf tournament was inaugurated in the summer of 1950 and this year the MIDWEST ENGINEER is being published on a 12-issue basis.

Another "first" this year will be the operation of the dining room and bar during the three summer months.

New activities in any enterprise require some sort of initial support in order to insure their becoming an established institution. Our dining room offers a fine lunch and a good dinner at a price that is less in comparison than that offered in any restaurant providing the features of a private club. If each of you who have a place of business in the downtown Chicago area will make it a point of having at least one meal a week in our dining room, and those of you who are located in the outskirts have at least one meal every other week in our dining room, you will not only enjoy good food at moderate cost, not only feel the gladness of heart that comes from a renewal of friendships, but you will have the satisfaction of making possible a volume of patronage that will help very much to absorb our overhead and help make possible even better food and service in the future.

It is your dining room, run on a nonprofit basis for you.

Digital Computers Past, Present and Future

By R. E. Meagher

University of Illinois

ENGINEERS always use mathematics as a necessary tool in their work. Perhaps the most important requirement placed upon an engineer is that he must be able to calculate with exactness the results of a given set of conditions without recourse to an experiment. This leads the engineer to applied mathematics.

One of the very first contacts with mathematics, which is probably remembered by every engineer, says that if there are two equations with two unknowns then a solution can be found for the two unknowns. This problem when first presented in high school is perhaps one of the first in which the engineer realizes the advantages of algebra. Later on the engineer finds in a more formal way that if there are n unknowns and n independent equations then all n of the unknowns can be found. This is an extremely important class of problems which occurs repeatedly in engineering work and science in general. In electrical engineering every application of Kirchoff's laws produces a set of simultaneous linear equations of exactly the type we have mentioned. In civil engineering the analysis of the stresses in a complex structure such as a bridge produces a set of linear equations of the same sort. A set of equations of more than just two or three unknowns becomes very cumbersome to handle; yet it occurs frequently in advanced engineering work. In about five minutes one can solve two such equations—with the help of a desk calculator if one wants accuracy to more than just a couple of places. But the solution has a number of operations which varies with the cube of n so that if one had a set of 40 equations with 40 unknowns the solution time would be $5 \times 20^3 = 40{,}000$ minutes. This would be about 100 working days. Today, machines are available which could solve the set of 40 equations and print the 40 answers in three minutes after the machine receives the information!

These machines carry out mathematical operations about 10,000 times as fast as an electric desk calculating machine. The machines which make possible this rather fantastic speed of operation are called high speed automatic digital computers and are most frequently referred to in newspaper articles as "giant brains." I would like to remove some of the mystery which newspaper reports try to import to high speed computers and provide some concise information on the status of their development at this time. We shall see also in what respects they are "giant brains" as compared to the human brain.

The development of automatic computers seems to start about 1825 with Charles Babbage, a professor at the University of Cambridge, England. Professor Babbage proposed at that time a computing machine, his analytical engine, which as distinct from other machines in that it was completely automatic. Thus Babbage's machine was designed so that it would automatically execute a complicated routine without recourse to help from a human being. Perhaps at this point I should very clearly make the distinction between an automatic machine of this sort, and a non-automatic machine such as the Abacus which was used in Asia many, many years before Babbage's time, or such as a modern desk calculating machine. It is evident that these are not automatic machines and require attention from the operator for each individual operation. The automatic machine goes along without intervention by an operator.

Babbage's machine was redesigned several times in the course of about twenty years work and it was never completed. Unfortunately, his ideas for an automatic machine were much ahead of the mechanical art necessary to produce a working machine. Even though he had some of the best machine techniques known at that time, the machine was never completed.

Babbage's machine was to have an addition time of one second for 50 digit numbers, and a multiplication and division time of one minute. Babbage also realized that if a calculation were to proceed automatically it would have to have a memory. He planned one of 1,000 numbers of 50 decimal digits each. A memory of this size is close to what seems necessary today. In short, Babbage had most of the basic mathematical ideas desirable for a machine but he did not have the practical means of making it.

The next digital computer development had to wait until the electrical relay, now used so much in telephone work, was sufficiently perfected to allow its use as a digital device. Using relays and mechanical parts, Professor H. H. Aiken of Harvard University and engineers at the International Business Machines Corporation designed a machine which was built by the IBM Company and finished in 1944. It was an automatic machine very much as Babbage had conceived it. This machine, called the Mark I calculator can properly be called the first operating automatic digital computer. It had only a small auto-

* Mr. Meagher, research professor of physics at the University of Illinois, Urbana, presented this paper before the Western Society on April 24, 1952.

matic memory, and it differed from Babbage's conception in this respect. Its addition time (for a 23 digit decimal number) is 0.3 second, its multiplication time is 4 seconds, and its division time is 11 seconds.

Dr. J. W. Mauchly and Dr. J. P. Eckert of the Moore School of Electrical Engineering of the University of Pennsylvania realized that it would be possible to construct a digital machine for the preparation of firing tables rather than an analog type machine which had been conceived for this purpose. As a result of this, Dr. Mauchly, Dr. Eckert, and a group of their associates constructed a machine called the ENIAC (Electronic Numerical Integrator and Calculator) which was completed in about 1945 and represents the very first use of the electronic tube as a binary device for a computing machine. This machine is at the Ballistic Research Laboratories of U. S. Army's Ordnance Corps at Aberdeen Proving Ground. The ENIAC, then, represented the first computing machine to use vacuum tubes as a switching device. The ENIAC is a first-class achievement because it increased enormously the speed of operations over any known system before. The ENIAC can do an addition in 200 microseconds. It uses 20,000 vacuum tubes and today some seven years after it was finished, it is operating 24 hours a day. For certain types of problems the ENIAC is only about three times slower than the newer machines available now, but for many other problems it suffers from a lack of flexibility which is brought about mainly because of its lack of a high-speed memory of sufficient capacity. The sequences of orders which can be carried out on the ENIAC are determined by hand-operated switches and interconnecting cables so that once a problem is set up it cannot be altered except by human intervention. All succeeding computers differ from the ENIAC in this one respect: they can change from one sequence of operations to another with the speed of the machine itself. In addition, the course of a particular problem can be altered as a result of work which has taken place in the past. The importance of this step is in itself very great indeed and has in the last five years changed our concept of what is called an automatic machine.

Since the ENIAC was finished, a number of machines have been designed and constructed which could take advantage of this more fully automatic feature. This required a high speed memory and the sonic mercury tank memory was introduced as the means of high speed storage which could be sufficiently flexible to accomplish this automatic purpose. The prominent machines of this type include the EDVAC, built by the Moore School and now at the Aberdeen Proving Ground of the U. S. Army, the SEAC at the Bureau of Standards, the BINAC and the UNIVAC, both built by the Eckert-Mauchly Company and the EDSAC at the University of Cambridge, England. In each of these cases, since the mercury tank was a serial device it tended to make it fit in well with what is called a serial machine. A serial machine handles numbers serially in an arithmetic operation—a parallel machine handles all digits of a number in an arithmetic operation at one time.

TABLE 1.

CHARACTERISTICS OF ORDVAC AND THE UNIVERSITY OF ILLINOIS COMPUTER

Machine Type	Parallel, Asynchronous
Register Capacity	40 binary digits
Memory Capacity	1,024 words of 40 binary digits
Addition Time	44 microseconds *
Multiplication Time (all ones, positive multiplier)	1,040 microseconds *
Multiplication Time (all zeros, positive multiplier)	610 microseconds *
Division Time	1,040 microseconds *
Memory Period	24 microseconds
Memory Access Time	24 microseconds minimum, 48 microseconds maximum
Time to Load Entire Memory	38 minutes
Time to Print Contents of Entire Memory	38 minutes
Number of Tubes	2,718
Machine d-c Power	8.3 kw
Machine a-c Power	8.8 kw
Total Primary Power (including power supplies and blowers)	35 kw
Kind of Input	5-hole Teletype tape
Input System (space is 5)	Sexadecimal
Output System	Sexadecimal Teletype
Number of Orders Available	Greater than 50

* These times do not include the times to get the numbers from the memory.

Vacuum Tube Memory

The latest class of computers which have either been built already or are well along in design, includes those which make use of a very high-speed memory using a vacuum tube as the memory element. The vacuum tube was particularly important because information could be stored not in a serial fashion which happens to be necessary in a mercury tank, but instead can be stored on a surface which is two dimensional and which may, therefore, be referred to in a parallel fashion. Machines which are perhaps representative of this class have achieved the highest speeds of any machines built today.

These include the *Whirlwind* machine at the Massachusetts Institute of Technology, the SWAC at the Bureau of Standards' Institute for Numerical Analysis at Los Angeles and a general purpose machine proposed by Professor J. von Neumann and his group of the Institute for Advanced Study, Princeton, New Jersey. A number of machines of this last type are under construction and two are finished. One of these, the ORDVAC has been built at the University of Illinois for the Ballistic Research Laboratories of the Ordnance Corps of the U. S. Army. Another is being built at the University now and will be used on the academic and research problems of the University's staff. The *Whirlwind* machine is the highest speed machine available and can, in fact, perform a multiplication of two 16 digit binary numbers in 50 microseconds. Sixteen binary digits correspond to about 5 decimal places. The other machines of which the ORDVAC and the University of Illinois machines are representative have a set of characteristics which is displayed in Table 1.

High speed computing machines of this automatic sort are usually thought of as having four parts: the input-output, the arithmetic unit, the memory, and the control. The input-output unit is that part of the machine where data can be put into the machine or removed from it. The arithmetic unit carries out the arithmetic operations and is similar in function to the electrical desk calculating machine. The memory stores numbers and instructions or orders. The control

connects the three other units together in a logical fashion.

In using a machine a problem must first be put into digital form and the course of arithmetic computations decided upon. This is called programming. Next, it is necessary to write this program in terms of the actual code of the machine. This is called coding. Generally this code is put on a punched paper tape and goes into the machine via the input unit. Results are printed from the output unit.

I would now like to emphasize the important developments which brought us to this state of computer development and perhaps try to indicate in what direction the work might proceed in the future.

The first machine which I mentioned, that due to Babbage, was intended to be a mechanical machine, but was ahead of the time for the mechanical development. Later mechanical machines were built, usually of the "desk" type, though for one reason or another they have not been automatic in type; the automatic type machines were left to the electrical engineers. An important development along the way associated with mechanical machines was the Hollerith card which was introduced by Hollerith in connection with census department work about 70 years ago. These are now familiar to us as business machine cards and are, of course, very extensively used. They are very important binary devices, but they do not lend themselves to automatic machinery since as soon as a hole is punched, it is not possible to "unpunch it" and because it is not possible to handle physical equipment such as cards at the very high speeds which have recently been achieved.

The introduction of a relay was a great step forward because relays can be made to operate very reliably for something like 109 operations, each of which can take place in something less than 0.01 second. The vacuum tube made possible the next very great increase in speed because it is fairly easy to design an electrical circuit using vacuum tubes in which voltages can change from one state to another in about one microsecond. Some careful attention to the circuitry can even make this time as short as .1 microsecond, but these are not very often resorted to as yet in computers because of the very large number of parts which have to be introduced if the speed of operation is made this high. These elements, together with non-switching components, such as resistors and condensers have made possible the development of everything except the memory device.

Switching Components

Memory devices can, of course, be built out of these same components but in general it takes at least one switching component for each element of memory. Thus, if one wants a memory of 1,000 numbers, each of 40 binary digits, one would obtain 40,000 switching elements as the minimum number necessary for storage. This is not impossible but it has been solved in a very different fashion. The first few computers such as the Mark I and the ENIAC either had no internal memory at all or their memories were based upon the same elements as the arithmetic portions of the machine. It was soon clear that these machines were limited by their memories and the development took successively the steps of a magnetic drum, a mercury delay line and then an electrostatic storage tube. The magnetic drum, an extension of the magnetic tape or wire service system of recording, makes possible the largest memory capacity but its speed is less than that of the other two memories. The electrostatic storage tube or cathode ray tube stores by storing an electrostatic potential distribution on some surface which has sufficient insulation so that this distribution does not change for a few tenths of a second. Some means is always provided to check the contents of the memory periodically and refresh it so that information can be stored indefinitely.

We now are looking forward to the development of computers which use still different components. It is entirely possible to construct either a memory or the operating portion of the machine using magnetic cores which have two well defined states or transistors. It is possible to store information in a magnetic core which might be only a quarter of an inch in diameter. It is also possible to make storage circuits and switching circuits with transistors and this is one of the most important trends which might de-

(*Continued on Page* 13)

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BOTTOM, left: Retiring President Becker
Wilfred Sykes
President Eshbach

TOP, left: Dr. Egloff
H. P. Sedwick
Clarence E. Davies, Speaker.

ANNUAL JUNE DINNER AND MEETING

Western Society's 84th annual meeting and dinner held June 4 brought to a close one of the most successful years in the Society's history and presented a very bright picture for the future.

More than 450 members and guests attended the meeting at the Furniture Club of America.

Donald N. Becker, retiring president, began the proceedings of the meeting by greeting the guests and introducing the members of the Board of Direction seated at the speakers' table.

Mr. Becker then presented the 14 members who attained Life Membership status this year. Those receiving the membership scrolls were: S. R. Bakhshi, Ralph W. Wagner, John Rossen, Rufus W. Putnam, Harry J. Penn, Roy A. Olsen, Milton Murr, R. I. MacDonald, J. Frank Lyman, Joel A. Fitts. John E. Deckert, Vernon L. Davies, James E. Burkross and E. Roy Wells.

In making the cash awards for the prize paper contest, Mr. Becker explained this year's contest rules providing for a maximum of five prizes of $100 each. This year two prizes were awarded. One went to Norman E. Brown, Territorial Development Engineer with the Public Service Co., for his paper, "Location of Industries in Chicago and Northern Illinois." The other recipient was James A. Stewart, Assistant District Superintendent, Illinois Bell Telephone Co., for his paper, "Traffic Engineering Design of Dial Telephone Exchanges."

Service awards for outstanding service to the Society during the past year were then presented by Mr. Becker. Recipients were: Charles A. Blessing in recognition of his outstanding service as chairman of the 1951-52 Educational Committee; Clifford B. Cox in recognition of his outstanding work as chairman of the 1950-51 and 1951-52 Civic Committees; Titus G. LeClair, in recognition of his outstanding service in implementing the general long-range developments plans of the Society, and Charles L. Mee for his outstanding service as chairman of the 1951-52 Advertising Committee.

In presenting the Octave Chanute Medal, Mr. Becker gave a brief history of the establishment of the fund by Octave Chanute in 1901. The award, made each year to the person presenting the best paper before the Western Society, this year was given to Horace P. Ramey, assistant chief engineer of the Sanitary District of Chicago. His paper was entitled, "Great Lakes Levels and Their Changes."

Next on the program was the presentation of an honorary membership to Wilfred Sykes, chairman of the executive committee of the Inland Steel Co. There now are 14 honorary members.

After making the various presentations of awards, Mr. Becker gave a brief summary of the activities of the past year. He said, "Your Society had a good year financially, and this is the third successive year which we have operated in the black. It is encouraging to note that as we keep abreast of each new responsibility the financial condition remains solvent.

"The membership committee under the able leadership of Lee Bird did a splendid job. They succeeded in obtaining 270 new applications.

"Our magazine, the MIDWEST ENGINEER, made great strides in both the quality of editorial matter, general make-up, and in the character and extent of advertising. For the first time in its existence the MIDWEST ENGINEER is going on a 12-month basis.

"Another first this year was the operation of the Society's dining room and bar by WSE rather than by con-

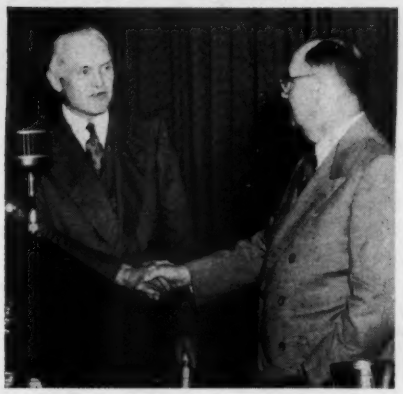
(*Continued on Page* 12)

Seated At The Speakers' Table—

ABOVE: Dr. Davies addresses members and guests on "Working Together."

BELOW: Retiring president Becker presents the certificate of the president's office to President Ovid Eshbach.

ABOVE, left to right: Norman E. Brown, Dean L. E. Grinter, Dr. Gustav Egloff, H. P. Sedwick and Dr. Clarence E. Davies, guest speaker.



RIGHT: D. N. Becker, Wilfred Sykes, President Eshbach, E. L. Chandler, Titus LeClair.

BELOW, LEFT: J. Earl Harrington, Charles L. Mee, A. P. Boysen, Charles A. Blessing.

BELOW, RIGHT: James A. Stewart, Arthur W. Howson, A. F. Jacobson, Clifford B. Cox, and W. R. Marston.

(*Continued from Page* 10)

cessionaires and both will remain open during the summer months.

"We have also made progress in our service to other societies. In accordance with the demands by other societies we are now taking steps to meet this increased demand for space.

"The technical programs and the programs at the Wednesday Noon Luncheons have been both interesting and successful. The noon luncheon programs will be continued during the summer and again I solicit your support of this activity. The Educational Committee under the able guidance of Mr. Charles Blessing was very active during the year and in conjunction with the other societies in the Societies Joint Education Committee a program of special courses were held throughout the year that were well attended. The committee also circulated a questionnaire to approximately 75 national and local business organizations concerning their ideas of the shortcomings of engineers who were slated for executive positions. As a result of this survey, the committee is making its recommendations for appropriate courses to be sponsored during the coming year. The Second Young Engineers Forum held last fall was very successful. Several industrial leaders from the Chicago area gave unselfishly of their time to make this series so rewarding. A third Young Engineers Forum will be run during the coming year. The Civic Committee under Chairman Clifford Cox worked industriously on a full agenda during the year. Of particular note is their recommendation which was submitted to the City Council in support of the No Parking Ordinance for Chicago and we can take pride that the resulting decision was in part a result of the Civic Committee's recommendation.

"The Amendment Committee also worked on a full agenda with several items which are being carried over to the incoming amendments committee. One of the outstanding recommendations made by this committee was that of providing for the addition of six trustees to the Board of Direction. The amendment was voted upon by the corporate membership and passed. The Development Committee submitted a resolution to the Board upon which the latter acted favorably recommending a change in our program committee and the type of program. It provides for an enlarged Program Committee consisting of 10 members at large and one representative from each of the sections or divisions and provides for two programs a month to be put on by the Committee on Monday night and that the sections or divisions may use the other two Mondays for section meetings.

"The social activities of the Society sponsored by the Special Events Committee were successful. The golf tournament, the Barn Yard Jamboree and the Cabaret party as well as several excursions provided a variety of activities that were participated in by various segments of the Society. I should like to sincerely thank the membership for having been privileged to be their servant and leader during the past year. The members of the Board, sections and committee officers all gave me splendid cooperation. Time will not permit me mentioning individually each one of you but I want to say thank you from the bottom of my heart.

Mr. Harrington and staff have gone through an extremely busy year and have again done a constructive and progressive job. Few realize the difficulties constantly imposed upon the staff and they therefore merit the thanks of the Society.

"It is now my privilege to present to you the man you have elected to take over the duties of president for the ensuing year. He has worked hard for the society and for the profession for a number of years and I know you all join me in wishing him every success and that you will give him the cooperation he deserves during the coming year. Ovid, I take pleasure in presenting to you this certificate of your election as president. Ladies and gentlemen, I present Ovid W. Eshbach, Dean of the Technological Institute of Northwestern University. Members—your new president."

Following the introduction, Mr. Becker presented Dean Eshbach with an engraved scroll certifying his election as president.

Dean Eshbach responded with a brief statement in which he outlined his aims for the coming year and urged greater cooperation between the various societies.

Mr. Becker then introduced the speaker of the evening, Dr. Clarence E. Davies, secretary of the American Society of Mechanical Engineers. In his speech, "Working Together," Dr. Davies emphasized the need for a broader sense of unity and for mutual understanding, respect and acquaintance to get together.

He went on to give a brief description of the development of engineering societies on the international, national, regional and local levels. He said, "These societies cannot be in competition for place or position. They must cooperate for a common goal and to solve their common problems."

Dr. Davies concluded his speech by saying that all engineers and their societies must think of engineering in terms of responsibility. Some of these responsibilities are advancing and extending engineering knowledge and art, encouraging cooperation, maintaining high standards of conduct and ministering to the public interest.

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(*Continued from Page 9*)

velop in the next few years. Besides the two I have mentioned, chemical elements can be used as switching devices or storage elements.

It is interesting to make a comparison between the human brain and the machines which are frequently referred to as "giant brains." The human brain is made up of elements called neurons, each of which requires about a thousandth of a second to change from one binary state to the other. A machine built out of neurons might be about 1,000 times slower than a corresponding high speed machine (as we know them today). On the other hand, the human brain has about 10^{10} neurons, whereas our high speed computers may have something like five or ten thousand elements. Thus, the human brain is something like one million times larger and perhaps correspondingly more complicated than our most complicated "giant brains." A million is a very large factor. The human brain makes use of these extra elements in many ways. Undoubtedly, large numbers of them are used for storage purposes and this is certainly one of the very great differences between a human brain and a "giant brain." Also, we now believe that the human brain uses many of its elements in a redundant way so that the failure of any single element does not normally cause an error. Thus, every single element in a human brain does not have to be functioning with one hundred percent reliability to get a correct answer.

On the other hand, most large computers as we know them today, do require every single switching element to be operating correctly in order to get a correct answer without repairs from a human being. The obvious question is, why do we not design computing machines to be more like the human brain, so that occasionally errors of individual elements do not cause errors in the final results. The answer to this question is given by the fact that to make a computer sufficiently redundant would require a very large number of elements and if we do that today, even with vacuum tubes as good as they are, we would find that we would be using staggering amounts of electrical power, enormous amounts of space and that we would be forced to change very large numbers of tubes every day. It is therefore clear that our present machines are many orders of magnitude, smaller and simpler than the human brain.

The question is often asked, can the so-called "giant brains" think. This is a question which depends somewhat upon the definition which one uses for "thinking." Ordinarily we ascribe to the human brain the ability to make decisions and to "originate" a thought. I believe that most computer people today would say that the general purpose computing machines can do these same things. They can make a decision about what to do in the course of a problem basing this decision, of course, on some evidence presented to it. This comes about by the use of "conditional transfer" orders. These are special orders which can alter the entire course of a calculation depending upon the sign of a number. The ability to originate a thought is, I think, a combination of memory and randomness. The randomness in a machine can be introduced by the calculation of pseudo-random numbers, and of course the machine already has a memory.

(*Continued on Page 14*)

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(*Continued from Page* 13)

Thus, the differences between the machine and the human brain results from the very enormous differences in the number of available switching elements. People in the computer field look forward to transistors because their very small size and very small power might permit their use in very large quantities. Perhaps the first use in this direction might be in redundant machines so that correct answers would be obtained even if an occasional transistor were not operating satisfactorily.

The preparation of problems for a high-speed computing machine is especially interesting to engineers. Each machine has a set of orders which can be written out very explicitly. A typical order in a machine takes a number from an address in the memory and adds it into the accumulator register. Another typical order takes a number from an address in the memory and multiplies it by the number already contained in another register. Another important order takes numbers from the input unit and inserts it into the accumulator. Still another order can transfer this number from the accumulator into the memory. Similarly, an order is available which prints the contents out on an electric typewriter. By means of orders of this type it is possible to build up a code or program for a complete problem. Very careful attention indeed must be paid to the use of every individual order. The first time this is done for each problem takes a long time. We have had some problems in which the coding has been worked on for a couple of months before the code was error-free. Fortunately, this needs to be done just once for each type of problem. For example, the problem of 40 simultaneous linear equations needs to be coded only once for all problems of this sort. Of course, the number of simultaneous linear equations, if it is less than 40, will have to be inserted in an appropriate place in the code and the coefficients for each equation must be inserted each time, but the basic code remains unaltered and a relatively inexperienced person can make use of the code. We see that one of the limitations in use of a machine is that the problem must be digitalized and coded. Another is in the limited capacity of the memory.

I have tried to summarize the development of computers up to our present day. I have not mentioned some computers at all—especially some commercially produced ones simply because they are similar to others which I did mention. I have presented figures to show how fast the machines really are for arithmetic computations. Now, have they affected us yet? The answer is that they have not affected us very much partly because they have just in the last few years come into use and partly because they have been used on work of a research type and there is always a large delay in time before the effect of research is felt in our daily lives. It should be remembered that only a few machines are now operating—only about 15 including all the large machines of any speed.

However, their effect in the future on all of the things about us will be very great. Their use in business and accounting work is directly understood. These machines are so fast that perhaps their greatest and most important use will not be mathematical calculations at all but in automatic control calculations. This means that the computer could compute the control signals for a vastly complicated process and thus be a part of what is more familiarly called a servo-loop. This is an application on which only very little work has been done with digital machines so far, but it may be the application where their effect would be greatest. These are sometimes called calculations in real time, because the calculation is made so fast that it can be used in the actual system from which the data is obtained.

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Reviews of Technical Books

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Sampling Inspections

Sampling Inspections by Variables, by Albert H. Bowker and Henry P. Goode, McGraw-Hill Book Co., New York, N. Y. First Edition, 1952—216 pages $5.00.

This book presents a comprehensive set of sampling plans for use when inspection of an item is by variables and when the lot is to be evaluated in terms of its percentage defective. These sampling plans can be used by industrial and business concerns for acceptance sample inspection of purchased products parts, and raw materials, for sampling inspection of goods in process and finished. Variations of sampling plans are presented with illustrative examples.

The core of the book is the 45 pages of variables tables and their operating characteristic curves.

The appendix describes practical computing techniques and graphical methods of applying the acceptance criteria which minimize the routine calculations required.

The more theoretical chapters cover general principles, properties of the plan, construction of sampling plans and standard procedure, and the mathematics involved.

H.P.H., W.S.E.

Exhaust Hoods

Exhaust Hoods, by J. M. Dalla Valle, The Industrial Press, 148 Lafayette Street, New York 13, N. Y., Second Edition, 1952—141 pages, $3.50.

Increased emphasis on industrial health hazards in plants where harmful and dangerous dusts, vapors, gases or fumes are generated has resulted in a demand for accurate design of exhaust systems, of which the hood is a most critical part. Backed by the author's 20 years' experience in the field of industrial hygiene, "Exhaust Hoods" is a concise assembly of both fundamental theory and of practical applications of theory to the actual design of hoods for all types of industrial installations.

Four chapters are devoted to the various aspects of theory, including flow of gases, velocity characteristics of canopy hoods, and criteria for determining hood effectiveness. Five chapters cover actual hood design for various types of applications. Other chapters cover booth-like structures, grille openings, woodworking machinery, examples of hood design calculations, entrance losses, and the essentials of good construction. Sample problems with solutions worked out in detail, are given in a chapter devoted entirely to this matter.

One hundred and twenty drawings and charts accompanv the descriptive matter. The index is adequate.

H.P.H., W.S.E.

New Edition of Engineering Handbook

A new second edition of the famous *"Handbook of Engineering Fundamentals,"* edited by Dean Ovid W. Eshbach of the Northwestern Technological Institute, was published in May by John Wiley & Sons.

Thirty-nine distinguished scientists contributed to this completely revised reference book, known for its thorough coverage of all phases of engineering. Since the appearance of the first edition in 1936, many new developments and changes in emphasis in various branches of technology have taken place, with the resulting need for an up-to-date version of this popular reference work. The discussions on mathematics, thermodynamics, and fluid mechanics have been entirely rewritten or revised. Similar treatment has been given to the sections on electricity and magnetism, engineering materials, and engineering law. A new section on aerodynamics stresses theory basic to the design and performance of aircraft.

Many other changes serve to develop the basic facts and principles presented in the book. The engineering tables, for example, now include standard structural sizes for aluminum, as well as data on tangents and offsets for the use of civil engineers. At the same time, the table on standards and symbols has been brought up to date, and new tables added for surveyors. The MKS system of units not only has been incorporated into the table of conversion factors, but receives greater emphasis throughout the entire edition.

Eshbach, who has been with the Northwestern Technological Institute since 1939, has contributed to the sections on "Mathematical and Physical Tables" and "Mechanics of Deformable Bodies." The other contributors to the second edition include the following: H. A. Ambrose, John L. Barnes, Mabel S. Barnes, Edward E. Bauer, A. C. Beiler, J. J. Beinlich, J. G. Brainerd, R. D. Buhler, George S. Cherniak, Merle E. Dowd, Ward V. Evans, R. D. Faber, William H. Gross, H. R. Hanley, H. S. Hansen, Paul R. Jones, Paul J. Kiefer, John M. Lessells, R. B. Lindsay, Joseph E. Love, Jr., John A. M. Lyon, L. J. Markwardt, John W. Miles, D. F. Miner, R. B. Oliver, Edson R. Peck, Janvier M. Rice, S. A. Rosecrans, Walter C. Sadler, Merhyle F. Spotts, Victor L. Streeter, Milton C. Stuart, E. R. Van Driest, Milton D. Van Dyke, Matthew Van Winkle, Ernst Weber, R. W. White, and R. A. Wilkins.

The second edition of "Handbook of Engineering Fundamentals" contains 1324 pages and is priced at $10.00.

Crerar Library

Notes and News

A recent acquisition of great interest is a collection of letters, specifications, construction schedules, estimates of financial reports relating to the early history of the Galena and Chicago Union Railroad. These came to the Library as a gift from John Van Nortwick of Batavia, Ill., who is a grandson of the John Van Nortwick who was chief engineer for the Galena and Chicago Union Railroad during its construction. He later was associated with the Aurora Branch Railway, which became the CB&Q in February, 1855, and subsequently served as president of the latter company.

Among the interesting papers in this collection is a manuscript report to the directors of the Galena and Chicago Union Railroad on preliminary surveys by Engineer Richard P. Morgan, December 24, 1847, and an exchange of letters between J. B. Turner, President of the G&CU and John Van Nortwick in negotiating the appointment of the latter as the road's chief construction engineer. Among the financial papers, there is one document entitled "Estimated Cost of 41 Miles of Road from Chicago to Elgin." In terms of modern costs, the summary figures of this estimate are startling: The items are: Grading and bridges, $84,000; timber for superstructure, $40,950; laying track and distributing materials, $20,500; iron and spikes, $799.50; fixtures and temporary buildings for 41 miles $6,100; outfit of cars and engines for 56,000 tons of freight, $45,300; incidental expenses, $9,600; right of way financing, $16,400; and engineering, $6,757.

* * *

A recent check of the Library's holdings of periodicals in the field of petroleum shows that our collections are very strong for research in this field. It is the policy of the Library to review the literature of subject fields from time to time for the purpose of filling in gaps in our list of subscriptions. As a result of our review of petroleum, we will add a number of foreign journals in this field.

With the cooperation of Dr. E. J. Crane, Editor of *Chemical Abstracts* and Dr. T. Katsurai of the National Diet Library, Tokyo, the Library is increasing materially its subscriptions to Japanese chemical journals. Dr. Katsurai has supplied us with a list of 12 titles which he and his co-workers consider to be the most important chemical journals now published in that country. While much of the text of these publications is in Japanese, they are all currently indexed in *Chemical Abstracts* and we believe it is important that they be available to research chemists in this area.

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Westinghouse Electric Corporation in Pittsburgh will shortly utilize a postal meter indicia which reads: ENCOURAGE OUR YOUTH TO CONSIDER THE OPPORTUNITIES IN ENGINEERING AND SCIENCE. Their advertising department advises that its post mark message will appear on all outgoing Westinghouse - headquarters mail which approximates 700,000 pieces of mail a year.

Meter slugs of this type can be obtained at a nominal cost by those interested in using this means of bringing one solution to the shortage to the attention of the public. Arrangements for procuring this slug can be made by sending the number of the Pitney Bowes Postal Model to the Engineering Manpower Commission, 20 West 39th Street, New York 18, N.Y.

(*Continued from Page* 5)

shown that if the solids entrained from the evaporators did not exceed 10 grains a gallon, they would have a negligible effect on the bio-loading of the cooling water when diluted in volumes from 10 to 15 million gallons.

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With this program and committment before them, the company started an intense rebuilding program late in 1944. Final delivery and installation of all the equipment was delayed by war shortages and postwar strikes until late 1949. During this period of rebuilding, the following program was carried out:

1. An entire new laboratory unit of three permanent employees under the direct supervision of the Process Chemists Division was set up. This unit collected daily operational data on the entrainment losses, bio-loading on all effluents leaving the plant and checked all trade waste losses.

2. Permanent sampling stations were

(*Continued on Page* 19)

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Western Society Launches Centennial of Engineering

To the Western Society of Engineers has been accorded the honor of launching the Centennial of Engineering. The nationwide celebration will be inaugurated with the opening performance of "From Adam to Atom" in the air cooled Theater of the Museum of Science and Industry on Saturday, July 12. The first three nights of the show have been designated as Western Society of Engineers Nights and 500 of the finest seats for each performance have been reserved for members of the Society.

"From Adam to Atom"—a spectacular show—brilliantly costumed with a delightful musical score—in 27 exciting scenes — this scintillating extravaganza spotlights the romance of engineering.

The Western Society programs—Saturday, Sunday and Monday—July 12, 13, and 14th will commence at 7:30 p.m. Reserved seats are $1.80, general admission, $1.20 for adults and sixty cents for children.

Hydraulics Conference

"Educating the Hydraulic Engineer" is the title of a talk to be presented by Dr. R. C. Binder, September 4, at a luncheon during the eighth annual National Conference on Industrial Hydraulics at the Sherman Hotel, in Chicago.

Dr. Binder is professor of mechanical engineering at Purdue University.

The conference, sponsored by Illinois Institute of Technology, will be held in conjunction with the Centennial of Engineering.

John G. Duba, conference secretary and faculty member of Illinois Tech, said that the first session of the conference will be a general meeting. D. K. Nason, Technical & Research Division, Beacon Laboratories, the Texas Co., Beacon, N.Y., will speak on "Low Temperature Application of Industrial Hydraulic Oils."

Mr. Lenox R. Lohr, President
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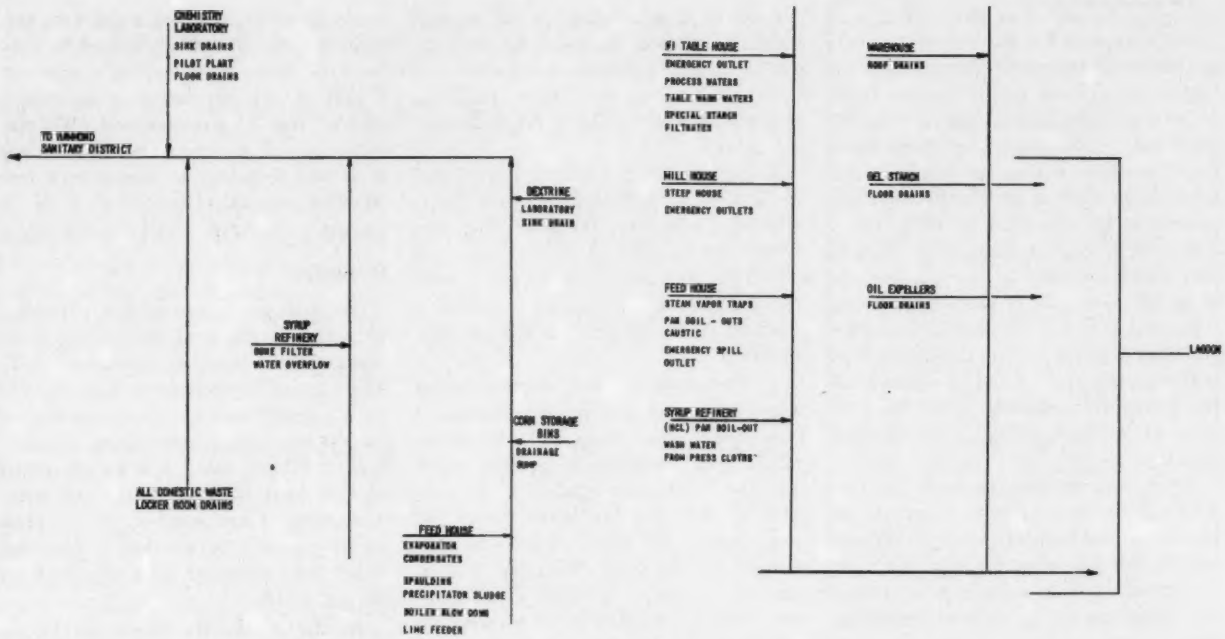

FIGURE NO. 6 - HAMMOND SEWER OUTLET

FIGURE NO. 7 - LAGOON OUTLET

(*Continued from Page* 17)

installed throughout the plant with automatic sampling devices as well as temperature and metering equipment.

3. Methods for reuse and bottling up of waste bearing water were developed.

4. An intense educational program was initiated to inform the process workers from bottom rank to superintendents of the problem.

5. Studies were made on ways of reducing the volatile loading of the steep water condensate.

At the end of 1949 we had reduced our total bio-loading to 4.0 P.E. per bushel of corn processed or a reduction of 60 per cent from 1944. We were still confronted with further reduction of the volatiles in the steep water condensate, possible losses of materials through floor drains, excess loading from the oil refinery, excess bone char wash water and excess process water.

The volatiles in the steep water condensate were reduced by aerating them with approximately 25,000 cubic feet per minute of air at atmospheric temperature. This treatment effects an average B.O.D. reduction of 53 per cent (about 15,000 P.E.). The temperature of the aerated condensate averages 80° F. as opposed to an initial temperature of 140° F. This appreciable temperature reduction is another asset. See Figure 4 for illustration of condensate aerators.

The air scrubbed condensate effluent has a normal pH of 2.0 and is very corrosive. To eliminate the hazard to sewer lines, boiler blow down water and the sludge from the lime-alum water treatment plant were added to these condensates. This mixture raised the pH to a value of 5.0. Additional lime is fed to the water by an automatic feeder to maintain a pH of 7.0 on the sewered condensate.

We also helped reduce the loading to the Hammond sewer system by using approximately 10 per cent of the air scrubbed condensate water in place of fresh water for washing the high protein cake produced in the Maco Department.

The problem of the floor drains was solved by the complete elimination of all floor drains from the sewer system. Floor drains could serve as avenues for the process worker to dispose of spills without supervisory detection.

We were unable to reduce the load from the oil refinery without installing approximately $100,000 worth of equipment. Since this was a small department and the returns from it did not justify such an expenditure, we discontinued refining oil.

The reduction of the excess bone char wash water was solved by:

1. Reuse of 10,000 gallons back in the refinery for washing filter presses.

2. Sixty thousand gallons are filtered and reused as wash water for starch used in making glucose.

3. The balance of 40,000 gallons is sent to the Hammond sanitary system.

4. The sugar content of the bone wash water was reduced to less than 600 pounds a day by washing the filters longer (sweetening off process). The excess sweet water along with other waste water from the department are concentrated for use in the feed.

5. Here again we made further reuse of water that normally went to the sewer. We had been using fresh water for flushing the syrup out of the bone char filters. We replaced the fresh water with the condensate from the second and third effects of the syrup and sugar evaporators. This condensate contains less than 170 P.P.M. of sugar solids but it is a change to conserve on fresh water and to save on heating the water as the condensate is about 140° F.

The problem of using more of the excess process water back into the system had to be approached cautiously because of the possibility of jeopardizing the quality of the finished product through the introduction of excess amounts of salts and solubles.

(*Continued on Page* 20)

(*Continued from Page* 20)

Our company, like the rest of the companies in the industry, operates under a bottled up system. In this system fresh water enters the process only on the filters washing the starch. The filtrate water from the starch washes are worked back through the system and finally leave the process as the concentrated steep water. The water balance in this system requires very careful control to avoid larger excesses which cannot be evaporated. Also, the separation of the starch from the gluten is dependent upon this balance as is the quality of the finished starch from the gluten is dependent upon this balance as is the quality of the finished starch.

After considerable research on this problem, we were able to eliminate all excess starch filtrates from the sewer system in the following manner:

1. Starch filtrate water is piped to our wet dust collecting system replacing fresh water.
2. Special starch filtrates formerly considered harmful to our bottled up system are now used back into the system.
3. A large starch filtrate holding tank was constructed for slowly metering those filtrates harmful to the system back to the Feed House evaporators.
4. The production of special starches producing filtrates containing salts harmful to animal feed in any quantity has been discontinued.
5. Careful scheduling of all special starch processing is practiced and the use of metering devices instigated.

In addition to the above problem, corrections were made in the following equipment:

1. Starch filter vacuum pump seal water lines were found to prime intermittently, subjecting the Lake Michigan system to occasional shock loads of starch filtrate water. To make this system foolproof, it was necessary to install a catch-all system to prevent this priming situation.
2. Steep water and manufacturing water heaters in use, proved unsatisfactory. There were times when the tubes would leak, discharging process water into the condensate rendering the condensate unfit for the boiler house. At such times the condensate was discharged to the Lake Michigan System causing a high bio-loading. These heaters, three in number, were replaced.

The floor drains from the Lactic Acid and Corn Syrup Solids department were bottled up which required a rather elaborate collecting system and proved to be more of a problem than we had anticipated. However, it has worked out quite satisfactorily.

At the onset of the trade waste abatement program the company realized that the bacterial condition of the water discharged back to Lake Michigan would be an important factor and plans were made ultimately to effect a coliform bacterial kill in all water discharged back into the lake. This condition was not a part of any stipulation or agreement entered into by the company. We now chlorinate all incoming raw lake water at a rate sufficient to maintain a free chlorine residual of 0.5-0.8 P. P. M. in all water discharged to Lake Michigan.

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Resume

To date the company has effected a reduction in the total bio-loading of its plant effluent from an average of 432,-423 population equivalents daily in 1948 to a present average daily loading of 34,000 population equivalents, a reduction of 92 per cent. A substantial part of this load is bone char wash water and steeps water condensate. A plant improvement program that is now well under way should reduce this load by 40 per cent.

In effecting the aforementioned 92 per cent reduction in the trade waste loading, the company has instituted control measures to eliminate the human factor as much as possible and thereby insure steady control with better than average freedom from accidental shock loads.

The present setup for the disposition of the effluent from the plant is illustrated by Figures 5, 6 and 7.

Conclusion

To accomplish this appreciable reduction in trade wastes, the company has invested roughly $850,000. It has replaced equipment which under normal conditions still possessed years of usefulness and it has injected practices into the normal manufacturing processes which at one time would be considered hazardous to final product quality. But it has accomplished its reduction in trade waste by the elimination and saving of solid materials normally considered waste and not by elaborate pre-treatment or sanitary disposal techniques.

American Maize has incurred direct benefits from this program in that the company now experiences a 1 per cent increase in overall plant yields over what was once thought normal. Figured at the present cost of corn this is roughly worth $175,000 a year. Of course, the company has exceeded the dictates of the law of diminishing returns to obtain this yield increase but it does help to support the overhead imposed by the program.

WSE Applications

In accordance with the By-Laws of the Western Society of Engineers, the following names of applicants are being submitted to the Admissions committee for examination as to their qualifications for admission to membership into the Society in the various grades, i.e., Student, Associate, Member, Affiliate, etc. All applicants must meet the highest standards of character and professionalism in order to qualify for admissions, and each member of the Society should be alert to his responsibility to assist the Admissions committee in establishing that these standards are met. Any member of the Society, therefore, who has information relative to the qualifications or fitness of any of the applicants listed below, should inform the Secretary's office, 84 E. Randolph St., RAndolph 6—1736.

242-83 Robert J. Dimmett, 1419 Elgin Ave., Forest Park, Ill.—attending Illinois Institute of Technology.

243-83 Stephen J. Zierak, Sales Engineer, The Green Fuel Economizer Co., Inc., 208 S. LaSalle St.

244-83 Erwin G. Heider, President & Owner of Commonwealth Plumbing Co. and Heider Engineering Corp., 5910 N. Western Av.

245-83 Warren N. Barr, St., President & Treasurer, Warren Barr Supply Co., 900 N. Spaulding Av.

246-83 Robert L. Kopel, Assist. Vice President's Office, Public Service Company of Northern Illinois, 72 W. Adams St.

247-83 James P. Barris, Structural Engineer, Vern E. Alden Co., 33 N. LaSalle St.

248-83 Miss Barbara A. Flynn, 713 E. 90th St.—attending University of Illinois, Navy Pier.

249-83 Patrick B. Henry, Engineer, Peoples Gas Light & Coke Co., 122 So. Michigan Av.

250-83 Jack B. Muir, Western Editor, Rogers Publishing Co., 4612 Woodward Ave., Detroit, Mich. (20 N. Wacker Dr.)

251-83 J. Wallace Miller, President, W-M Corporation, 608 S. Dearborn St.

252-83 Thomas P. Cunningham, Jr., Engineer, New York Central Railroad, R-425, LaSalle Street Station.

253-83 G. H. S. Stewart, Mech: Plant Layout, Koppers Co., Inc., 109 N. Wabash Av.

254-83 Robert E. Budde, Field Engineer, Bristol Co., 351 E. Ohio St.

255-83 David A. Davis, Divisional Engr. (Powerhouse Div.), Link-Belt Co., 300 W. Pershing Rd.

256-83 John R. Landgraf, General Supt., Commonwealth Plumbing Co., 5910 N. Western Av.

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WSE Personals

F. A. Hess, a member of WSE, has been named assistant chief engineer of the New York Central System-Lines West of Buffalo, the Indiana Harbor Belt Railroad Co., and the Chicago River and Indiana Railroad Co.

Lorence A. Laning now is with the Civil Engineering Corps of the U. S. Navy. A graduate of Northwestern University with a bachelor of science degree in mechanical engineering, Mr. Laning was employed as a junior engineer with the Peoples Gas Light and Coke Co.

John P. Donovan has informed the Western Society headquarters office that he now is with the Engineering Service Bureau in Chicago. Mr. Donovan, a member since 1949, formerly was with A. J. Boynton and Co.

David H. Bottrill has been named secretary of the Oil Heat Institute in New York City. Mr. Bottrill formerly was a senior design engineer with the Cerro de Pasco Corp., in New York.

Obituaries

Charles S. Duke, consultant in civil engineering, died June 12 at the Mayo Clinic, Rochester, Minn. A member of Western Society since 1920, he became a life member in 1951.

Mr. Duke for many years was associated with the city bridge department and had spent a great deal of time in the Virgin Islands and Cuba while in the government service.

William E. Findlater, structural engineer with the American Bridge Co., died June 14 at the age of 61. Mr. Findlater joined the Society in 1920 and became a life member in 1951.

Howard D. Shaw, 51, housing manager, civic and philanthropic leader, died June 15. Mr. Shaw had been a member of WSE since 1939 and was very active on the Civic Committee for many years.

Associated with the Chicago Housing Authority since 1940, Mr. Shaw was also a member of the board of directors of the Chicago Urban League, a member of the Henry Booth Settlement House board of trustees, director of the Abraham Lincoln Center and member of the governing council of the South Side Planning Board.

Theodore L. D. Hadwen, one of the oldest members of the Western Society of Engineers, died June 12. A member of Western Society since 1899 and a life member since 1932, Mr. Hadwen was born in Richmond, Surrey, England. After his graduation from the London Imperial School of Engineering, he came to the United States and worked for nearly 60 years as a civil engineer for the Chicago, Milwaukee and St. Paul Railroad.

Mr. Hadwen was a life member of the American Society of Civil Engineers and a past president of the American Railway Bridge and Building Association.

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"OVER THE MANAGER'S DESK"

One of the ways employers can do something to help eliminate some of the current shortage of engineers is to review their engineering positions with the thought of trying to use men over 60 wherever they can. Many of these men can offer excellent experience, short cuts, more economical methods, and good practical ideas. Some are available for either full time or part time assignments as a consultant or as a direct employee. For the man over 60 who is active and still able to do good engineering work, the present conditions may offer the opportunity for continued usefulness in your profession. We will be glad to discuss the possibilities of the man over 60 with anyone who is interested at any time.—B. H. A.

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R-8949 TECHNICAL DIRECTOR. Graduate C. E. Age: to 45. 5 yrs. experience in building field. Duties: Act as technical director of building material institute, conduct and arrange programs, visit universities and supervise tests, good personality able to meet people. Salary: $6000 plus per year. Location: Chicago.

R-8971 MINERAL DRESSING ENGINEER. B.S. Mining or Chemical Engineering. Age: to 35 Knowledge of flotation agents. Salary: $3500-$7000 depending on experience. Chicago.

R-8970 FIELD ENGINEER. C.E. Sanitation. Age: 25-35. 2 years plus experience in sewerage work or treatment plants. Duties: Office and field work handling promotional or consulting work relative to cement or concrete for sewerage or treatment plants. Salary: $400-$500. Employer may negotiate fee. Travel 20%. Location: Chicago.

R-8966 CHEMICAL ENGINEER. Advanced Degree. Age; to 40. 1-5 yrs. experience in petroleum or related field. Duties: Staff function of preparing studies and interpretative reports for executive officers. Ability to write is essential. Work is rather broad in nature. Should be interested in co-ordinating and economics work as well as basic engineering studies. Salary; to $6000. Location: Chicago.

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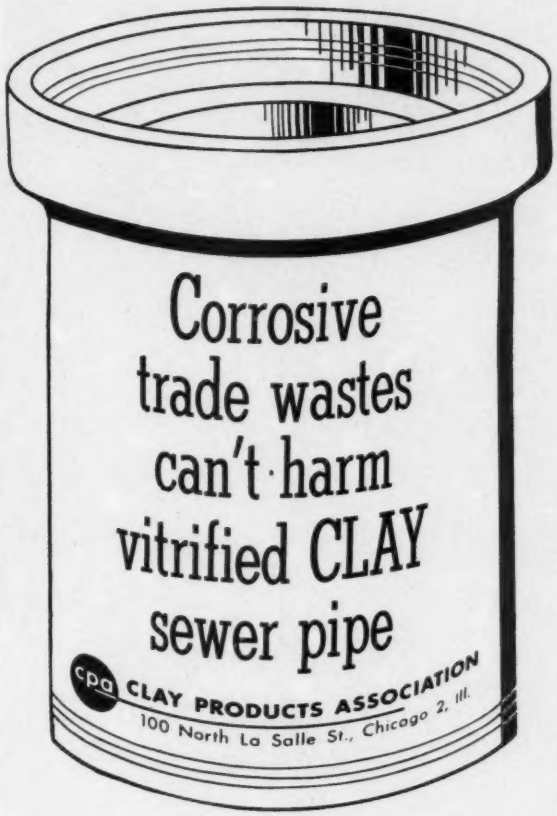

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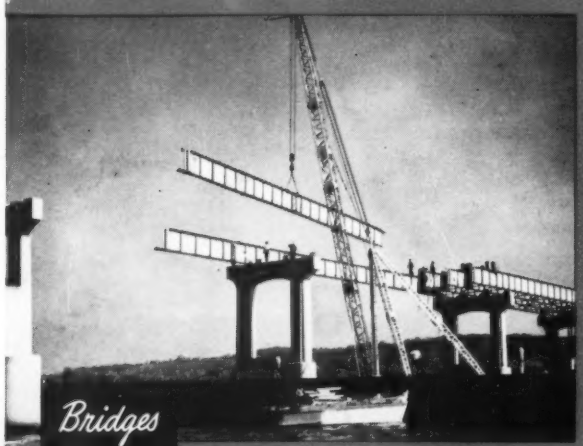

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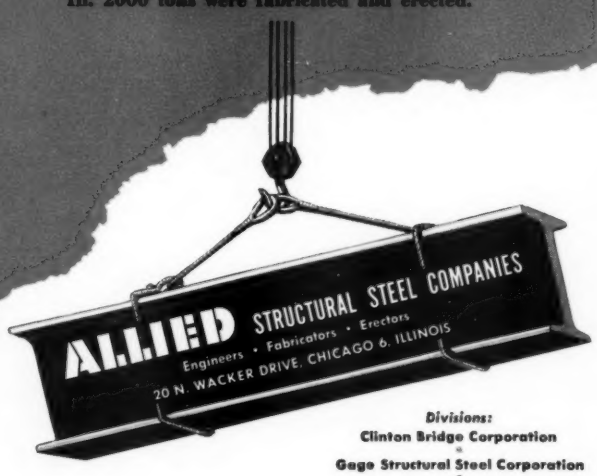

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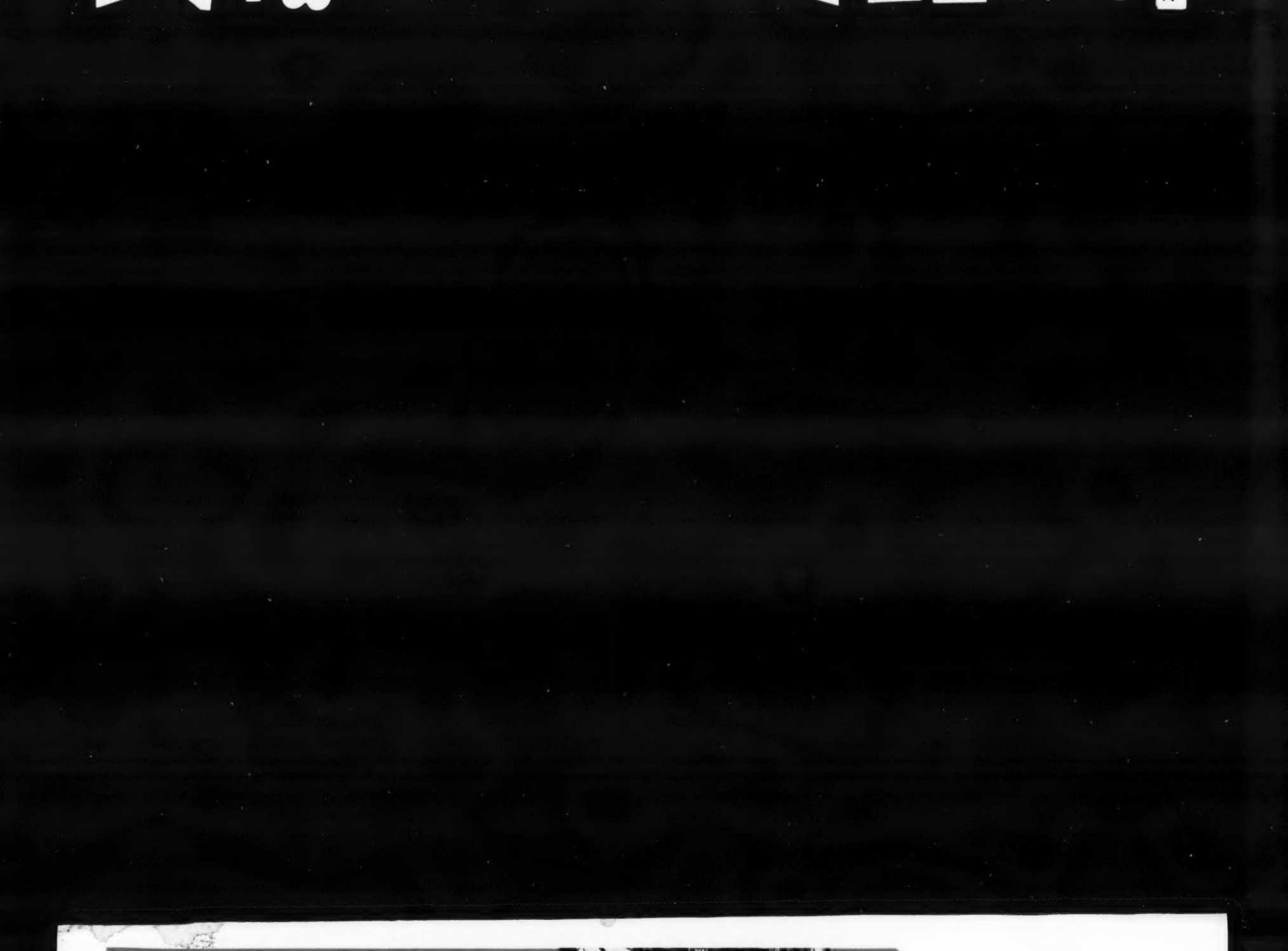
Clinton Bridge Corporation

Gage Structural Steel Corporation

Midland Structural Steel Corporation